

REMARKS

In response to the above-identified Office Action, Applicants amend the Application and seek reconsideration thereof. In this Response, Applicants amend claims 1 and 3. Accordingly, claims 1-3 are pending.

Attached hereto is a mark-up version of the changes made to the Specification and claims by the current amendment. The attachment is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Priority

The Office noted the Applicants have not filed certified copies of the priority documents. The Applicants herein submit the attached certified copies of the Korean Industrial Property Office Applications Nos. 99-2257 filed on January 25, 1999 and 99-51148 filed on November 17, 1999.

Specification

The Office objects to the disclosure for a sentence that begins on page 3, line 24 and runs through page 4, line 5. As indicated herein, Applicants amend the Specification to correct the confusing sentence. Applicants respectfully request approval of the Specification as amended.

Claims objection to

The Office objected to claim 3 because of the following informalities. In lines 3 and 5, ^{coating}coating was used wherein the Office suspects the word coating should be used. Furthermore, lines 13-16 should be deleted because they contain the same limitations as lines 17-20. As indicated herein, Applicants amend the claim to correct the spelling and to remove the duplicated limitations. Accordingly, Applicants respectfully request approval of the Specification as amended.

Claims Rejected Under 35 U.S.C. § 112

The Office rejected claim 3 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as the invention. The Office stated that the phrase of the metal oxides in line 3 of claim 3 had insufficient antecedent basis. As indicated herein, the Applicants amend the claim to remove the phrase "the metal oxides" in line 3, and replace it with the phrase "a lithium metal oxide" therefore. Accordingly, Applicants respectfully request approval of the claim as amended.

Claims Rejected Under 35 U.S.C. § 102

The Office rejects claims 1 and 3 under 35 U.S.C. § 102(e) as being anticipated by Idota et al (hereinafter "Idota"), U.S. Patent No. 6,235,427 B1. The Office states that a negative current collector made of a copper-based alloy foil prepared by adding at least one material selected from the group consisting of magnesium, tin, boron, chromium, manganese, silicone, cobalt, vanadium, zirconium, niobium, phosphorous, bismuth, lead, silver, and misch metal to copper-based material selected from the group consisting of copper, copper/nickel, copper/titanium, copper/nickel/titanium is anticipated by Idota which recites the limitation of current collector for negative electrode including copper, stainless steel, nickel, titanium, and alloys thereof. The Applicants respectfully disagree.

In order to anticipate a claim, the relied upon reference must disclose every limitation of the claim. The Idota reference discloses a foil used as a current collector wherein the material of a current collector preferably has a purity of 98% or higher, more preferably 99% or higher, particularly preferably 99.3% or higher. Idota, col. 11, lines 59-61. Applicants respectfully submit that a disclosure calling for a purity of 98% or higher may disclose therein an alloy constituent comprising up to, but not exceeding,

2%. The Applicants respectfully submit that an alloy comprising up to 4% nickel, 4% titanium, or up to 5% boron, at least is not anticipated by a foil having a purity of 98%. The absence of alloy constituents exceeding 2% in the Idota reference is fatal to the asserted rejection of anticipation. Accordingly, Applicants respectfully request withdrawal of rejection of claims 1-3 as anticipated by Idota.

Claims Rejected Under 35 U.S.C. § 103

The Office rejects claims 1-3 under 35 U.S.C. § 103(a) as being unpatentable over Kawakami et al. (hereinafter Kawakami), U.S. Patent No. 5,702,845 in view of Idota, U.S. Patent No. 6,235,427 B1. The Applicants respectfully disagree

In order to render a claim obvious, the relied upon references must teach or suggest every limitation of the claims such that the invention as a whole would have been obvious at the time the invention was made to one skilled in the art. Claims 1 and 3 each recite copper-based alloy foil is prepared by adding at least one material selected from the group consisting of magnesium, tin, boron, chromium, manganese, silicone, cobalt, vanadium, zirconium, niobium, phosphorous, bismuth, lead, silver, and misch metal to copper-based material selected from the group consisting of copper, copper/nickel, copper/titanium, and copper/nickel/titanium".

In making the rejection, the Office refers to Kawakami's description of desirable materials for electrode collector that are highly conductive and inactive to battery reaction. Examples of the desirable material include nickel, titanium, copper, aluminum, stainless steel, platinum, palladium, gold, zinc, various alloys and a complex metal comprising at least two kinds of the above materials. The Applicants respectfully submit that none of these materials or alloys cited in the Kawakami reference include the elements claimed in claims 1 and 3. Thus, Kawakami neither teaches nor suggests a method which includes the addition of these alloy constituents of claims 1 and 3 to the

makeup of the current collector. Applicants note that copper-based alloy foil include nickel and titanium disclosed in cited references, does not achieve the mechanical strength of the foil disclosed in this Application as detailed in Table 1 and described on page 5, lines 3-12 of the Application as filed.

The Idota reference discloses a current collector wherein the material of the current collector preferably has a purity of 98% or higher as discussed above. Thus, the Idota reference fails to cure the defect in the Kawakami reference. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 1 and 3 as obvious over Kawakami in view of Idota.

Regarding claim 2, the Office suggested a skilled artisan would have considered it obvious to add a minor amount of nickel or titanium to the copper foil material. The Office states that Kawakami teaches when the copper is used alone, copper may be dissolved and deposited on the other electrode. This is from col. 8, lines 47-51. The Office goes on to state thus copper is desirably used after being coated with a more inactive material, such as nickel or titanium. Thus, the skilled artisan would know that it is desirable to have a current collector consisting mainly of copper (highly conductive) with a minor amount of nickel or titanium (thus reactive under battery conditions than copper). The Applicants respectfully disagree.

The difference between plating and alloying is manifest. Though a similar quantity of a material such as nickel or titanium compared to the quantity of the base metal copper may be used in both plating and alloying, under specific alloying conditions, plating is an environment where the surface of the copper material is entirely coated in the protective material, in this case nickel or titanium. Alloying, on the other hand, is a situation where the copper material is thoroughly infused with the alloy constituent, in this case nickel or titanium. A plating in this environment provides

a seal against chemical attack to the reactive copper collector. Alloying changes the chemical composition of the copper yet does not form a complete shield. One of skill in the art would *not* have reason to think that alloying a material with a constituent will serve the same function as plating the material with that constituent.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending (1) are in proper form and (2) are neither obvious nor anticipated by the relied upon art of record, and (3) are in condition for allowance. A Notice of Allowance is earnestly solicited at the earliest possible date. If the Examiner believes that a telephone conference would be useful in moving the Application forward to allowance, the Examiner is encouraged to contact the undersigned at (310) 207-3800. If there are any fees due in connection with the filing of this response, please charge Deposit Account No. 02-2666.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly extension of time fees.

Respectfully submitted,

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Dated: 9/13/01

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CERTIFICATE OF MAILING:

I hereby certify that this correspondence is being deposited as First Class Mail with the United States Postal Service in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on September 13, 2001.

Nadya Gordon 9/13/01
Nadya Gordon Date

Attachment: VERSION WITH MARKINGS TO SHOW CHANGES MADE



VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

The paragraph on page 3, line 24, beginning with "The negative electrode may be produced" has been amended as follows:

The negative electrode may be produced by dissolving ~~an active material into or from which lithium ions are intercalated or deintercalated~~ a negative active material which can reversably intercalate/deintercalate lithium ion (i.e., carbonaceous materials such as crystalline carbon or amorphous carbon, or SnO_2) and a polyvinylidene binder in N-methyl pyrrolidone to make a slurry. The slurry is coated on a negative collector of the present invention and then dried. The negative collector preferably has a thickness of 20 μm of thickness can be used for the collector without the deterioration of mechanical properties, such as its tensile strength.

IN THE CLAIMS

The claims are amended as follows:

1. (Amended) A lithium secondary battery comprising:

a positive electrode formed by coating a lithium metal ~~oxides-oxide~~ on a positive current collector;

a negative electrode formed by coating carbonaceous materials or SnO_2 on a negative current collector; where the negative current collector ~~being~~ is made of a Cu-based alloy foil with a thickness of 20 μm or less and the Cu-based alloy foil ~~including~~ is prepared by adding at least one material selected from the group consisting of ~~nickel, titanium, magnesium, tin, zinc, boron, chromium, manganese, silicone, cobalt, iron, vanadium, aluminum, zirconium, niobium, phosphorous, bismuth, lead, silver, and~~

misch metal to a copper-based material selected from the group consisting of copper, copper/nickel, copper/titanium, and copper/nickel/titanium;

a separator interposed between the positive and negative electrodes; and

an electrolyte into which the positive and negative electrodes and the separator are immersed.

3. (Amended) A method for making a lithium secondary battery comprising the steps of:

forming a positive electrode by ~~coating the metal oxides~~ coating a lithium metal oxide on a positive current collector;

forming a negative electrode by ~~coating~~ coating carbonaceous materials or SnO_2 on a negative current collector; where the negative current collector ~~being~~ is made of a Cu-based alloy foil with a thickness of 20 μm or less and the Cu-based alloy foil ~~including~~ is prepared by adding at least one material selected from the group consisting of ~~nickel, titanium, magnesium, tin, zinc, boron, chromium, manganese, silicone, cobalt, iron, vanadium, aluminum, zirconium, niobium, phosphorous, bismuth, lead, silver,~~ and misch metal to a copper-based material selected from the group consisting of copper, copper/nickel, copper/titanium, and copper/nickel/titanium;

interposing a separator ~~interposed~~ between the positive and negative electrodes; and

injecting an electrolyte ~~into which~~ to immerse the positive and negative electrodes and the separator ~~are immersed~~

~~interposing a separator between the positive and negative electrodes; and~~

~~immersing the positive and negative electrodes and the separator into an electrolyte.~~